

We Claim:

1. A method of adhering copper thin film to a substrate in an integrated circuit

structure comprising:

preparing a substrate, including forming active regions, vias and trenches for

5 interconnect structures;

depositing a metal barrier layer on the substrate;

depositing an ultra thin film layer of tungsten over the barrier metal layer;

depositing a copper thin film on the tungsten ultra thin film layer;

removing excess copper and tungsten to the level of the metal barrier layer; and

10 completing the integrated circuit structure.

2. The method of claim 1 wherein said depositing an ultra thin film layer of tungsten

includes depositing a tungsten layer having a thickness of between about 1 nm to 5 nm.

15 3. The method of claim 1 wherein said depositing an ultra thin film layer of tungsten

includes depositing the tungsten by a deposition method taken from the group of methods

consisting of MOCVD and ALD.

4. The method of claim 1 wherein said depositing an ultra thin film layer of tungsten

20 includes depositing the tungsten from a precursor taken from the group of precursors consisting of

$\text{WF}_6$  and  $\text{W}(\text{CO})_6$ .

5. The method of claim 1 wherein said depositing a barrier metal layer includes  
depositing a layer of material taken from the group of materials consisting of Ta, TiN, TaN and  
TiSiN.

5 6. The method of claim 1 wherein said depositing a barrier metal layer includes  
depositing a layer of material to a thickness of between about 5 nm to 10 nm.

7. The method of claim 1 wherein said depositing a barrier metal layer includes  
depositing a layer of material by PVD, ALD or MOCVD.

10 8. The method of claim 1 wherein said depositing a copper thin film includes  
depositing a layer of copper to a thickness sufficient to fill vias and trenches in the structure.

9. The method of claim 8 wherein said depositing a copper thin film includes  
15 depositing a layer of copper to a thickness sufficient to fill vias and trenches in the structure  
includes depositing a layer of copper to a thickness of between about 10 nm to 20 nm.

10. The method of claim 1 wherein said depositing a copper thin film includes  
depositing a layer of copper by PVD, ALD or MOCVD.

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11. A method of adhering copper thin film to a substrate in an integrated circuit structure comprising:

preparing a substrate, including forming active regions, vias and trenches for interconnect structures;

5 depositing a metal barrier layer on the substrate;

depositing an ultra thin film layer of tungsten over the barrier metal layer to a thickness of between about 1 nm to 5 nm from a precursor taken from the group of precursors consisting of WF<sub>6</sub> and W(CO)<sub>6</sub>;

depositing a copper thin film on the tungsten ultra thin film layer;

10 removing excess copper and tungsten to the level of the metal barrier layer; and completing the integrated circuit structure.

12. The method of claim 11 wherein said depositing an ultra thin film layer of tungsten includes depositing the tungsten by a deposition method taken from the group of methods 15 consisting of MOCVD and ALD.

13. The method of claim 11 wherein said depositing a barrier metal layer includes depositing a layer of material taken from the group of materials consisting of Ta, TiN, TaN TaSiN and TiSiN.

14. The method of claim 11 wherein said depositing a barrier metal layer includes  
depositing a layer of material to a thickness of between about 5 nm to 10 nm.

15. The method of claim 11 wherein said depositing a barrier metal layer includes  
5 depositing a layer of material by PVD, ALD or MOCVD.

16. The method of claim 11 wherein said depositing a copper thin film includes  
depositing a layer of copper to a thickness sufficient to fill vias and trenches in the structure.

10 17. The method of claim 16 wherein said depositing a copper thin film includes  
depositing a layer of copper to a thickness sufficient to fill vias and trenches in the structure  
includes depositing a layer of copper to a thickness of between about 10 nm to 20 nm.

18. The method of claim 11 wherein said depositing a copper thin film includes  
15 depositing a layer of copper by PVD, ALD or MOCVD.

19. An integrated circuit having a copper interconnect therein formed over a layer of barrier metal comprising:

a substrate, including active regions, vias and trenches for interconnect structures;

a metal barrier layer formed on the substrate, wherein said metal barrier layer is

5 taken from the group of materials consisting of Ta, TiN, TaN and TiSiN, and formed to a thickness of between about 5 nm to 10 nm;

an ultra thin film layer of tungsten formed on the barrier metal layer, said tungsten ultra thin film layer having a thickness of between about 1 nm to 5 nm; and

10 a copper thin film layer formed on the tungsten ultra thin film layer to a thickness to sufficient to fill the vias and trenches in the structure

20. The integrated circuit of claim 19 wherein said ultra thin film layer of tungsten is formed from a precursor taken from the group of precursors consisting of  $\text{WF}_6$  and  $\text{W}(\text{CO})_6$ .

15 21. The method of claim 19 wherein said depositing a copper thin film includes depositing a layer of copper to a thickness sufficient to fill the vias and trenches in the structure includes depositing a layer of copper to a thickness of between about 10 nm to 20 nm.